

WHAT IS CLAIMED IS:

1. An interconnect for testing a semiconductor component comprising:

5 a substrate comprising a recess; and

a contact on the substrate configured to electrically engage a bumped contact on the component, the contact comprising a support member for supporting the bumped contact proximate the recess, and a plurality of leads on the  
10 substrate attached to the support member, the leads configured to permit the support member to move into the recess and to twist the support member relative to the bumped contact during movement into the recess.

15 2. The interconnect of claim 1 wherein the leads are arranged in a spiral relative to an axis of the contact.

3. The interconnect of claim 1 wherein the leads have an extensible configuration.

20

4. The interconnect of claim 1 wherein the support member comprises an opening having a peripheral edge for penetrating the bumped contact.

25 5. The interconnect of claim 1 wherein the support member comprises at least one projection for penetrating the bumped contact.

6. An interconnect for testing a semiconductor  
30 component comprising:

a substrate comprising a recess and a plurality of conductors;

a polymer film attached to the substrate; and

a contact on the substrate configured to electrically engage a bumped contact on the component, the contact comprising a support member proximate the recess for supporting the bumped contact, and a plurality of leads on the polymer film in electrical communication with the conductors and attached to the support member, the support member and leads configured to move within the recess and to rotate relative to the bumped contact during movement into the recess.

7. The interconnect of claim 6 wherein the leads are electrically connected to the conductors using a conductive adhesive layer.

8. The interconnect of claim 6 further comprising a plurality of conductive vias in the substrate in electrical communication with the conductors and with a terminal contact on the substrate.

9. The interconnect of claim 6 wherein the support member comprises a non-bonding outer surface relative to the bumped contact.

10. An interconnect for testing a semiconductor component comprising:

a substrate comprising a recess and a plurality of conductors;

a polymer film attached to the substrate comprising an opening aligned with the recess; and

a contact configured to electrically engage a bumped contact on the component, the contact comprising a plurality of leads on the polymer film in electrical communication with the conductors, and a support member attached to the leads and suspended proximate the recess, the support member

located proximate the opening and configured to move into the recess, the leads configured to exert a torque on the support during movement into the recess.

5           11. The interconnect of claim 10 further comprising a conductive polymer on the substrate electrically connecting the leads to the conductors.

10           12. The interconnect of claim 10 wherein the support member comprises an opening with a peripheral edge for penetrating the bumped contact.

15           13. The interconnect of claim 10 wherein the support member comprises a projection for penetrating the bumped contact.

20           14. The interconnect of claim 10 wherein the conductors are formed on a first surface of the substrate and the substrate comprises a plurality of conductive vias in electrical communication with the conductors and with a terminal contact on a second opposing surface of the substrate.

25           15. An interconnect for testing a semiconductor component comprising:

          a substrate; and

          a contact on the substrate configured to electrically engage a bumped contact on the component, the contact comprising:

30           a recess in the substrate;

          a plurality of leads on the substrate cantilevered on the recess and having a generally spiral configuration with respect to an axis of the contact; and

a support member attached to the leads configured to support the bumped contact proximate the recess, to move the bumped contact within the recess with an external biasing force, and to twist about the axis during movement into the  
5 recess to penetrate the bumped contact.

16. The interconnect of claim 15 wherein the support member comprises an opening for retaining the bumped contact and a peripheral edge for penetrating the bumped contact.  
10

17. The interconnect of claim 15 wherein the support member comprises a projection for retaining and penetrating the bumped contact.

18. The interconnect of claim 15 wherein the leads comprise a polymer film attached to the substrate.  
15

19. The interconnect of claim 15 wherein the substrate comprises a conductor and a conductive via in electrical  
20 communication with the leads.

20. The interconnect of claim 15 wherein the leads have an extensible configuration.

21. The interconnect of claim 14 wherein the leads have a serpentine configuration.  
25

22. The interconnect of claim 14 wherein the support member comprises a non-bonding conductive polymer outer  
30 layer.

23. The interconnect of claim 14 wherein the support member comprises a material selected from the group consisting of Ti,  $\text{TiSi}_2$  and Al.

24. An interconnect for testing a semiconductor component comprising:

a substrate; and

5 a contact on the substrate for electrically engaging a bumped contact on the component, the contact comprising a support member for supporting the bumped contact, and a plurality of spring segment leads on the substrate attached to the support member, the leads configured to permit the  
10 support member to move towards the substrate during electrical engagement of the bumped contact and to rotate the support member about an axis of the contact during movement thereof.

15 25. The interconnect of claim 24 wherein the substrate further comprises a conductor on the substrate and a conductive via in the substrate in electrical communication with the leads.

20 26. The interconnect of claim 24 wherein the support member comprises an opening having a peripheral edge for penetrating the bumped contact.

25 27. The interconnect of claim 24 wherein the support member comprises at least one projection for penetrating the bumped contact.

28. The interconnect of claim 24 wherein the leads  
30 comprise extensible members.

29. The interconnect of claim 24 wherein the leads have a serpentine configuration.

30. An interconnect for testing a semiconductor component comprising:

a substrate;

a contact on the substrate for electrically engaging a  
5 bumped contact on the component, the contact comprising:

a support member with an opening therein having a peripheral edge for retaining the bumped contact; and

a plurality of leads attached to the substrate for  
suspending the support member on the substrate, the leads  
10 comprising spring segments having a generally spiral configuration configured to twist the support member about an axis during movement towards the substrate to allow the peripheral edge to penetrate the bumped contact.

15 31. The interconnect of claim 30 wherein the leads comprise a metal selected from the group consisting of tungsten, titanium, nickel, platinum, iridium, and vanadium.

32. The interconnect of claim 30 wherein the support  
20 member comprises a non-bonding outer layer.

33. The interconnect of claim 30 wherein the support member comprises a conductive polymer outer layer.

25 34. A method for fabricating an interconnect for testing a semiconductor component comprising:

providing a substrate;

forming a plurality of conductors on the substrate;

forming a recess in the substrate;

30 providing a polymer film comprising an opening therein and a support member proximate to the opening configured to support a bumped contact on the component, and a plurality of leads attached to the support member, the leads configured to permit the support member to move in a z-direction into the

recess and to twist the support member relative to the bumped contact during movement thereof;

aligning the support member with the recess; and

attaching the film to the substrate with the leads in  
5 electrical communication with the conductors.

35. The method of claim 34 wherein the attaching step comprises forming a conductive polymer layer between the conductors and the leads.

10

36. The method of claim 34 further comprising providing the support member with an opening having a peripheral edge for penetrating the bumped contact.

15

37. The method of claim 34 further comprising providing the support member with a non-bonding surface relative to the bumped contact.

20

38. A method for fabricating an interconnect for testing a semiconductor component comprising:

providing a substrate;

forming a recess in the substrate;

forming a polymer material in the recess;

forming a metal layer on the substrate and polymer  
25 material;

etching the metal layer to form a contact comprising a support member for electrically engaging a bumped contact on the component and a plurality of leads configured to permit the support member to move into the recess; and

30

removing the polymer material from the recess.

39. The method of claim 34 further comprising forming a non-bonding outer layer on the metal layer prior to the etching step.

40. The method of claim 34 wherein the non-bonding outer layer comprises a material selected from the group consisting of Ti,  $\text{TiSi}_2$ , Al and conductive polymers.

5

41. The method of claim 34 wherein the etching step comprises forming the leads with a generally spiral configuration.

10

42. The method of claim 34 wherein the etching step comprises forming the leads with an extensible configuration.

43. The method of claim 34 wherein the metal layer comprise a metal selected from the group consisting of tungsten, titanium, nickel, platinum, iridium, and vanadium.

15

44. The method of claim 34 further comprising forming an electrically insulating layer within the recess.

20

45. The method of claim 34 wherein the substrate comprises silicon and forming the recess comprises an anisotropic etch process.

46. A method for fabricating an interconnect for testing a semiconductor component comprising:

25

providing a substrate;

forming a plurality of polymer bumps on the substrate;

forming a metal layer on the polymer bumps and on the substrate;

30

etching the metal layer to form a contact comprising a support member for electrically engaging a bumped contact on the component, and a plurality of leads attached to the support member and to the substrate; and



following the etching step, removing the polymer bump from the substrate to form a contact comprising the support member suspended on the substrate and the leads configured to permit the support member towards the substrate during electrical engagement of the bumped contact.

47. The method of claim 46 further comprising during the etching step forming the support member with a peripheral edge for penetrating the bumped contact.

10

48. The method of claim 46 further comprising during the etching step forming the support member with a projection for penetrating the bumped contact.

49. The method of claim 46 further comprising during the etching step forming the leads in a spiral configuration configured to twist the support member relative to the contact bumps during movement thereof towards the substrate.

50. The method of claim 46 further comprising during the etching step forming the leads in an extensible configuration.

51. The method of claim 46 further comprising forming a non-bonding outer layer on the support member.

52. A system for testing a semiconductor component comprising:

a carrier for retaining the semiconductor component;  
an interconnect on the carrier comprising a substrate and a contact on the substrate configured to electrically engage a bumped contact on the component, the contact comprising a support member for supporting the bumped contact proximate a recess in the substrate, and a plurality of leads

on the substrate attached to the support member, the leads configured to permit the support member to move into the recess and to twist the support member relative to the bumped contact during movement into the recess; and

5 test circuitry in electrical communication with the leads for applying test signals to the component.

53. The system of claim 52 wherein the component comprises an element selected from the group consisting of  
10 semiconductor dice, semiconductor packages and semiconductor wafers.

54. The system of claim 52 wherein the leads comprise a polymer film attached to the substrate.

15

55. A system for testing a semiconductor component comprising:

a carrier configured to retain the component;

an interconnect on the carrier comprising:

20

a substrate;

a recess in the substrate;

a plurality of leads on the substrate cantilevered on the recess and having a generally spiral configuration with respect to an axis of the contact; and

25

a support member attached to the leads configured to support the bumped contact proximate the recess, to move the bumped contact within the recess with an external biasing force, and to twist about the axis during movement into the recess to penetrate the bumped contact.

30

56. The system of claim 55 wherein the interconnect further comprises a conductive via in electrical communication with the leads and a terminal contact electrically connectable to test circuitry.

57. A system for testing a semiconductor component comprising:

a carrier configured to retain the component;

5 an interconnect on the carrier comprising:

a substrate; and

a contact on the substrate for electrically engaging a bumped contact on the component, the contact comprising a support member for supporting the bumped contact, and a plurality of spring segment leads on the substrate attached to the support member, the leads configured to permit the support member to move towards the substrate during electrical engagement of the bumped contact and to rotate the support member about an axis of the contact during movement thereof.

58. The system of claim 57 wherein the support member comprises a non-bonding outer layer.

59. A system for testing a semiconductor component comprising:

a wafer prober;

an interconnect mounted to the wafer prober comprising:

25 a substrate comprising a recess and a plurality of conductors;

a polymer film attached to the substrate; and

a contact on the substrate configured to electrically engage a bumped contact on the component, the contact comprising a support member proximate the recess for supporting the bumped contact, and a plurality of leads on the polymer film in electrical communication with the conductors and attached to the support member, the support member and leads configured to move within the recess and to

rotate relative to the bumped contact during movement into the recess.

60. The system of claim 59 wherein the substrate  
5 comprises a pad in electrical communication with the leads  
and the wafer prober comprises a spring loaded electrical  
connector configured to engage the pad.